Palo Verde Nuclear
Generating Station

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192-01070-WEI/DGM/RAS
September 21, 2000

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Unit 2
Docket No. STN 50-529
License No. NPF-51
Licensee Event Report 2000-001-00

Attached please find Licensee Event Report (LER) 50-529/2000-001-00 prepared and submitted pursuant to 10CFR50.73. This LER reports an automatic reactor trip which occurred on August 26, 2000 following an unexpected closure of the main steam isolation valves. The reactor trip was classified as uncomplicated. The corrective actions described in this LER are not necessary to maintain compliance with regulations. This letter makes no commitments to the NRC.

In accordance with 10CFR50.73(d), a copy of this LER is being forwarded to the Regional Administrator, NRC Region IV and the resident inspector. If you have questions regarding this submittal, please contact Daniel G. Marks, Section Leader, Regulatory Affairs, at (623) 393-6492.

Sincerely,

WEI/DGM/RAS

Attachment

cc: E. W. Merschoff (all with attachment)
M. B. Fields
J. H. Moorman
INPO Records Center

IE22

NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
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TITLE (4)

Reactor Trip Due To Unexpected Closure Of Main Steam Isolation Valves

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
08	26	2000	2000	- 001 -	00	09	21	2000	N/A	
									FACILITY NAME	DOCKET NUMBER
									N/A	

OPERATING MODE (9)	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
	20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)
	20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71
	20.2203(a)(2)(ii)		20.2203(a)(4)	X	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Daniel G. Marks, Section Leader, Nuclear Regulatory Affairs	623-393-6492

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
X	SB	RJX	T078	Y					

SUPPLEMENTAL REPORT EXPECTED (14)			EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On August 26, 2000, at approximately 1539 Mountain Standard Time, Unit 2 was in Mode 1 (POWER OPERATION), when a loss of power to an "A" train logic control cabinet occurred causing all four main steam isolation valves (MSIVs) and the "A" train feedwater isolation valves (FWIVs) to close. An automatic reactor trip was initiated and the primary plant was stabilized in Mode 3 (HOT STANDBY) in forced circulation with both steam generators used for heat removal via the atmospheric dump valves.

Subsequent to the reactor trip, one of the two 13.8 kV electrical distribution buses failed to complete a fast bus transfer which resulted in a loss of power to two of the four reactor coolant pumps. Operations personnel successfully cross-connected the electrical loads normally supplied by this bus to an available power source. In addition, reactor coolant system activity was monitored and acceptable operational limits were not exceeded. The event did not adversely affect the safe operation of the plant or the health and safety of the public.

In the past three years there have been no similar events reported where a failed power supply caused the closure of MSIVs.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

1. REPORTING REQUIREMENT(S):

This LER (50-529/2000-001-00) is being submitted pursuant to 10 CFR 50.73(a)(2)(iv), to report a reactor protection system (EIIS: JC) initiated reactor trip which occurred on August 26, 2000 at approximately 1539 Mountain Standard Time (MST).

2. DESCRIPTION OF STRUCTURE(S), SYSTEM(S) AND COMPONENT(S):

The paragraphs in this section provide brief descriptions of the major equipment and systems that were relied upon, influenced, or had a significant function in this event.

Main Steam and Feedwater Isolation Actuation System (MSFIS) (EIIS: SB)

The MSFIS is a solid-state digital class 1E system which provides signals to energize and de-energize control solenoids which open, close, or exercise the plant main steam isolation valves (MSIVs) (EIIS: SB, ISV) and feedwater isolation valves (FWIVs) (EIIS: ISV). The MSFIS utilizes solid-state digital circuits for all system logic and timing functions while maintaining compatibility with other systems through input isolation relays and output relays.

The power supplies used in the MSFIS assembly are high-efficiency direct current to direct current stabilized converters manufactured by Technipower, Inc. They feature short circuit, overvoltage, and reverse source polarity protection. The input 125 v direct current power, in addition to powering the power supplies, also feeds the input buffer relays and the valve solenoids.

Reactor Protection System (RPS)(EIIS: JC)

The RPS provides a rapid and reliable shutdown of the reactor to protect the core and the reactor coolant system pressure boundary from potentially hazardous operating conditions. Shutdown is accomplished by the generation of reactor trip signals. The trip signals open the reactor trip switchgear (RTSG) breakers (EIIS: AA, BRK), de-energizing the control element drive mechanism (CEDM) coils (EIIS: AA), allowing all CEAs to drop into the core by the force of gravity.

Main Steam Isolation Valves

The main steam isolation valves are hydraulic actuated, double disc, wedge valves. One MSIV is installed in each 28 inch main steam line just downstream of the main steam safety valves (MSSVs) (EIIS: SB) and atmospheric dump valves (ADVs) (EIIS: AB). The MSIVs are designed for rapid positioning and will close automatically within seconds following receipt of a main steam isolation

signal. MSIV controls are provided in the control room. Each MSIV is provided with an independent, self contained hydraulic actuator and two independent, redundant and opposite train powered hydraulic supply systems. A main steam isolation signal from either train will actuate one hydraulic actuator per valve and all four MSIVs will close.

Onsite Non-Class Electrical Distribution System

During normal plant operation, power for the onsite non-Class 1E alternating current system is supplied through the unit auxiliary transformer (EIIS: EA) connected to the generator isolated phase bus. Two offsite sources are provided to meet startup, shutdown, and post-shutdown requirements of the unit. Each unit's non-Class 1E power system is divided into two parts arranged so that the possibility of a forced shutdown due to loss of one part will be minimized. Each of the two parts supplies a load group including approximately half of the unit auxiliaries.

Three startup transformers (EIIS: EA) connected to the 525 kV switchyard are shared between Units 1, 2, and 3 and are connected to 13.8 kV (EIIS: EA) buses of the units. Each startup transformer is capable of supplying 100 percent of the startup or normally operating loads of one unit simultaneously with the engineered safety feature (ESF) (EIIS: JE) loads associated with two load groups of another unit. The non-Class 1E ac buses normally are supplied through the unit auxiliary transformer, and the Class 1E buses normally are supplied through the startup transformers. In the event of loss of supply from the unit auxiliary transformer (except for overcurrent trip), an automatic fast transfer of the 13.8 kV buses to the startup transformers is initiated to provide power to the auxiliary loads.

Reactor coolant pumps (RCPs) (EIIS: AB) 1A and 2A are connected to one 13.8 kV bus and RCPs 1B and 2B are connected to the other 13.8 kV bus. Electrical supply for reactor coolant pumps is arranged so that the pumps will normally remain electrically connected to the turbine-generator for 20 to 30 seconds following a turbine trip should offsite power not be available.

3. INITIAL PLANT CONDITIONS:

On August 26, 2000, at approximately 1539 MST, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION), operating at approximately 100 percent power. There were no major structures, systems, or components that were inoperable at the start of the event that contributed to the event.

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TEXT *(If more space is required, use additional copies of NRC Form 366A)* (17)

4. EVENT DESCRIPTION:

On August 26, 2000, at 15:39:53 MST, Palo Verde Unit 2 was in Mode 1 (POWER OPERATION), when a loss of power to the "A" train MSFIS logic control cabinet occurred. One second later at 15:39:54 MST, low FWIV accumulator pressure alarms were received and at 15:39:55 MST alarms were received for the "A" train MSIV accumulators. At 15:39:57 MST all four MSIVs closed.

Control room personnel (utility-licensed operators) observed control board indication that the MSIVs had closed and began implementing a manual reactor trip when at 15:40:02 MST, channel "A" and "D" high pressurizer pressure setpoints (2383 pounds per square inch absolute (psia)) were met and an automatic reactor trip was initiated by the reactor protection system. All control element assemblies (CEAs) (EIIS: AA) inserted into the reactor core. As a result of the MSIV closures and the consequent rapid decrease in heat removal, main steam safety valves opened at 15:40:05 MST and maintained primary and secondary pressures within 110 percent of design pressure.

Subsequent to the reactor trip, one of the two non-class 13.8 kV electrical distribution buses lost power when it failed to complete a fast bus transfer to the startup transformer source. The loss of this electrical distribution bus caused a loss of power to two of the four reactor coolant pumps, as well as other non-class electrical loads. Operations personnel established a cross-connection to an available 13.8 kV source to supply the electrical loads supported by this bus.

Control room personnel entered the applicable emergency operations procedures and diagnosed the event as a reactor trip. The shift manager classified the event as an uncomplicated reactor trip. No engineered safety features automatically actuated and none were required. The plant was stabilized in Mode 3 (HOT STANDBY) in forced circulation with both steam generators used for heat removal via the ADVs. Feedwater to the steam generators was initially restored via the "B" train motor driven essential auxiliary feedwater (AFW) (EIIS: BA) pump and was later maintained by the "N" train motor driven non-essential auxiliary feedwater pump.

Following the reactor trip, control room personnel entered limiting condition for operation (LCO) 3.4.17(A) for reactor coolant system (RCS) (EIIS: AB) specific activity greater than 1.0 µCi/gm. Chemistry personnel (utility, non-licensed) monitored RCS dose equivalent iodine and confirmed that acceptable operational limits were not exceeded. By 0807 MST on August 27, 2000, RCS dose equivalent iodine had decreased to less than 1.0 µCi/ml and the LCO was exited. No other significant LCOs were entered as a result of the reactor trip.

At 19:37 MST, APS made notification of the event to the Nuclear Regulatory Commission (NRC) via the emergency notification system (ENS# 37261).

5. ASSESSMENT OF SAFETY CONSEQUENCES:

The plant responded as required, the reactor trip was uncomplicated, no safety limits were exceeded, and the event was bounded by current safety analyses. With the exception of the failure of one train of the electrical distribution system to fast transfer, this event was as expected for a loss of heat removal caused by rapid closure of the MSIVs and "A" train FWIVs. Analysis of the available data indicates that the plant protection system responded as required to trip the reactor due to high pressurizer pressure. The trip occurred at the proper setpoint and was responded within the required time frame.

Primary and secondary pressure boundary limits were not exceeded as a result of the reactor tripping from a steady state condition. The transient did not cause any violation of the safety limits (i.e., departure from nucleate boiling ratio, linear heat rate, pressurizer pressure). Therefore, there were no adverse safety consequences or implications as a result of this event. This event did not adversely affect the safe operation of the plant or health and safety of the public.

The failure of the MSFIS power supply is not a condition that alone could have prevented the fulfillment of a safety function as defined by 10CFR50.73(a)(2)(v).

6. CAUSE OF THE EVENT:

An independent investigation of this event is being conducted in accordance with the APS corrective action program. Although additional investigative activities remain to be completed, the cause of the reactor trip appears to be a hardware induced power supply failure (Technipower model CLC 115/15-15) (EIIS: RJX) that resulted in a loss of hydraulic supply system control to the MSIVs and the train "A" FWIVs.

Post-trip analysis of non-class 13.8 kV electrical distribution buses 2ENANS02A and 2ENANS04B revealed the fast transfer problem was due to a failed Beckwith relay (EIIS: EA, RLY).

No unusual characteristics of the work location (e. g., noise, heat, poor lighting) directly contributed to the event. No personnel errors or procedural error contributed to this event

7. CORRECTIVE ACTIONS:

(Immediate Corrective Actions)

Control room personnel took immediate action to place the reactor in a stable condition in accordance with the appropriate operating procedures.

MSFIS control cabinet 2-JSG-A-C01 and 13.8 kV switchgear busses NAN-S04B and NAN-S02A were quarantined and actions were commenced to troubleshoot and, if necessary, repair equipment.

APS reactor engineering performed a review of post trip data and concluded that the Safety Limits (DNBR, Linear Heat Rate, and Pressurizer Pressure) were not exceeded.

Unit 2 plant performance and plant protection system evaluations were performed to determine plant responses to the transients experienced during this event. The plant performance evaluation included a safety function impact analysis for each of the safety functions and included an assessment of equipment malfunctions, abnormal alarms and/or events observed during the event.

(Corrective Actions To Prevent Recurrence)

The failed Technipower model no. CLC 115/15-15 power supply from the MSFIS control cabinet was replaced.

The failed Beckwith relay will be replaced during the upcoming Unit 2 refueling outage which is scheduled to be completed in November, 2000. (Note: A replacement Beckwith relay was not immediately available and plant management, with input from engineering, determined that Unit 2 would be restarted with 2ENANSO2 cross-connected to the startup transformer.)

8. PREVIOUS SIMILAR EVENTS:

In the past three years there have been no similar events reported where a failed power supply caused the closure of MSIVs/FWIVs.

9. ADDITIONAL INFORMATION:

The reactor trip was a single actual initiating event that affected only the initiating event cornerstone in the regulatory oversight and assessment process. The event was tabulated as an Unplanned

Scram, and an Unplanned Scram with Loss of Heat Removal, in the performance indicator cornerstone of initiating events.